



2003 AFCEE Technology Transfer Workshop

San Antonio, Texas

Promoting Readiness through Environmental Stewardship

Enhanced DNAPL Recovery From Fractured Limestone

Air Force Plant 4, Fort Worth, TX



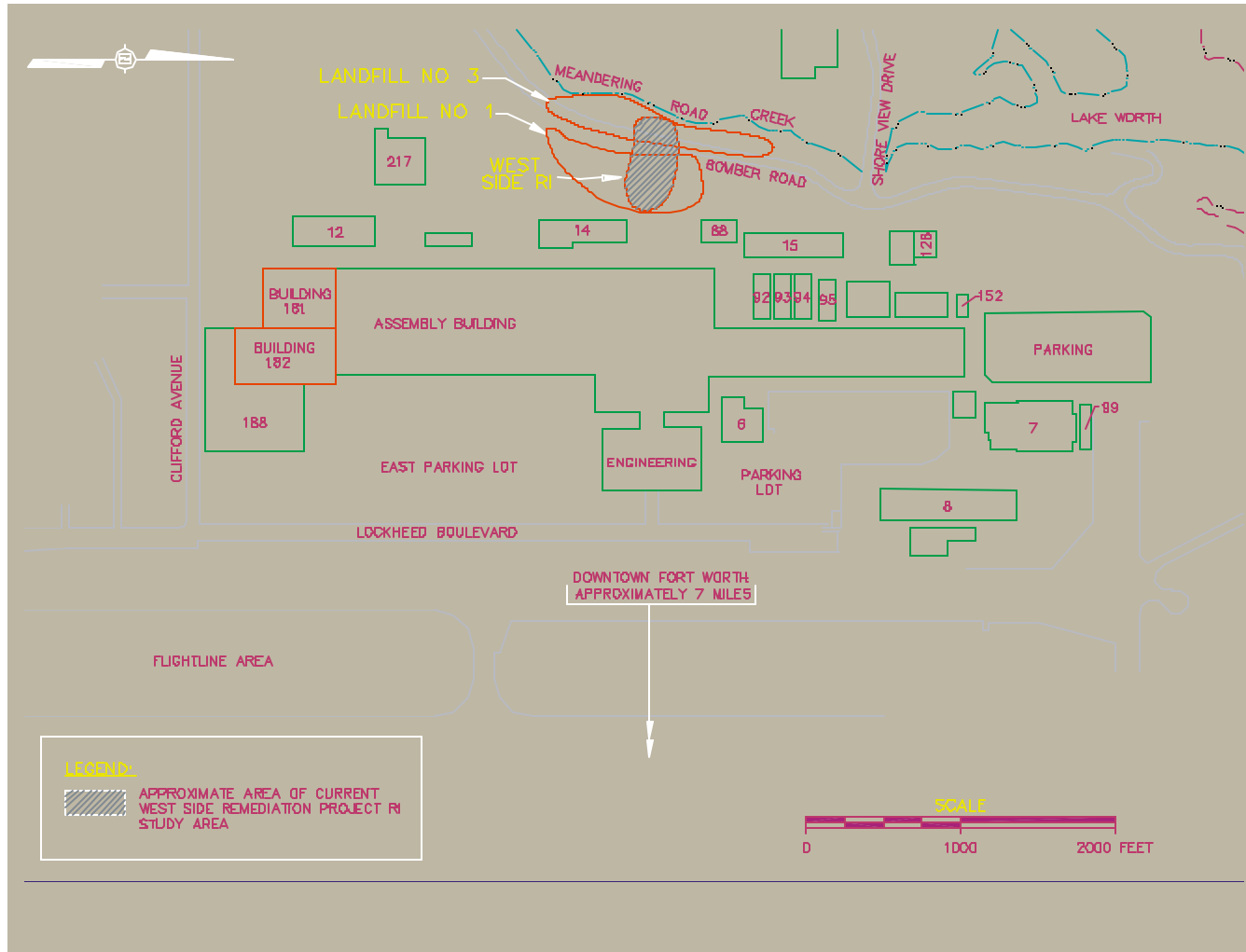
Shaw Environmental & Infrastructure, Inc.

Richard B. Wice

February 25, 2003

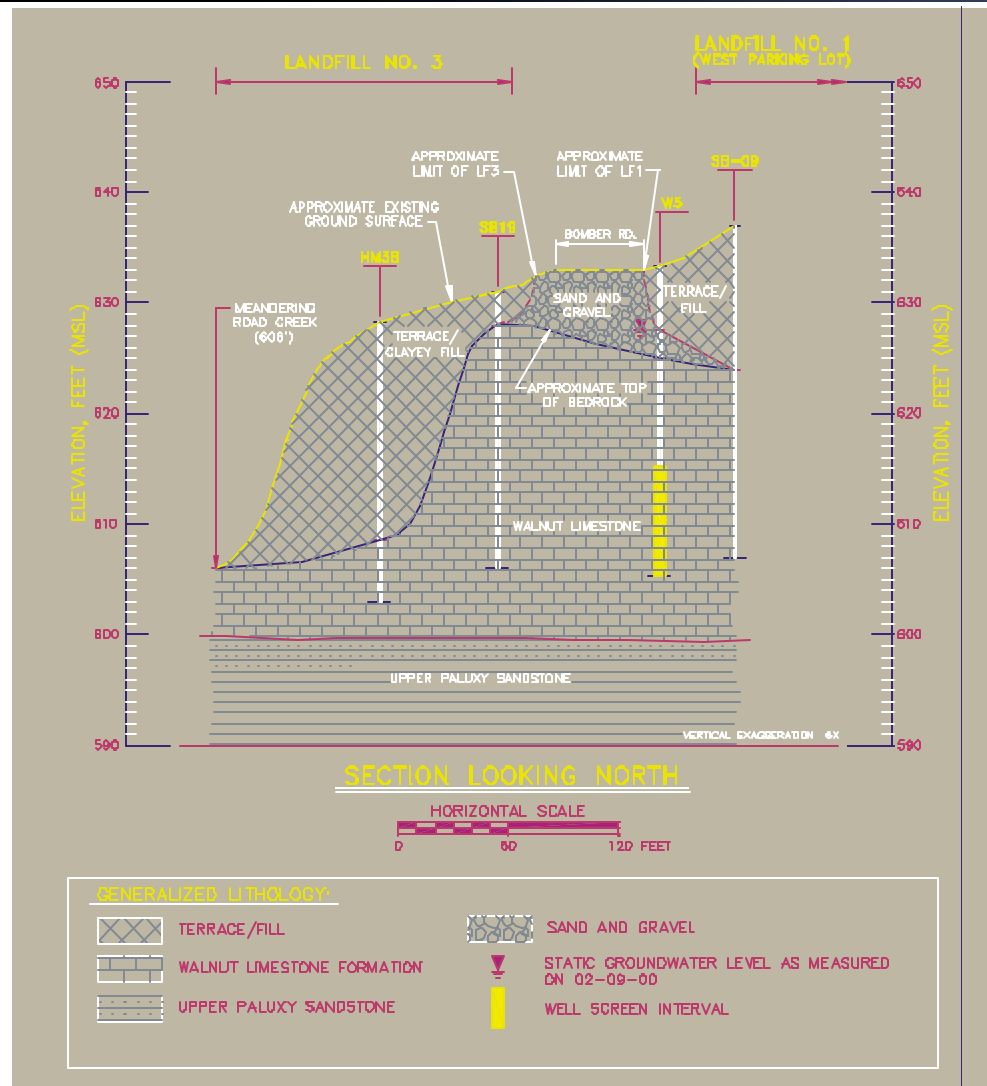


Location of LF1 and LF3 at AFP4





Cross Section Through LF1 and LF3





Walnut Rock Core



Promoting Readiness through Environmental Stewardship



Aquifer Testing in Landfill 1 Area



Promoting Readiness through Environmental Stewardship



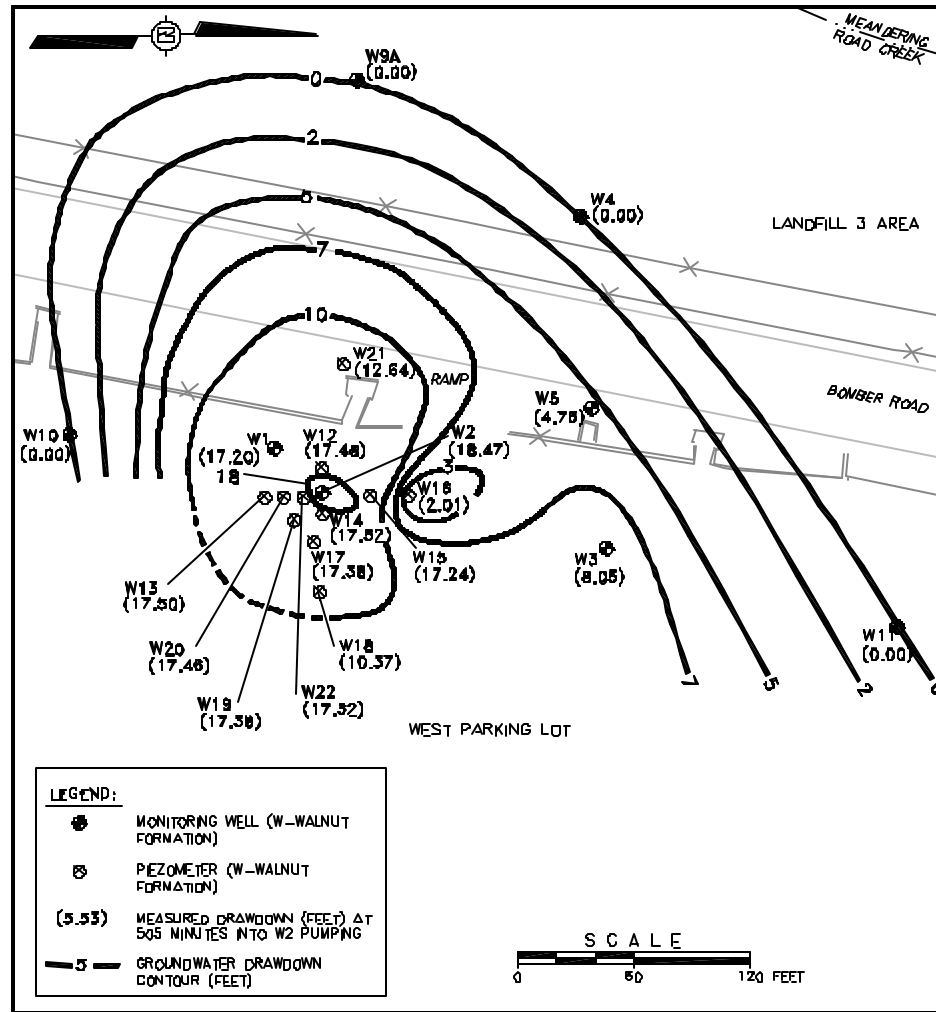
Well W2 Aquifer Test



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Walnut Groundwater Drawdown At 505 Minutes Into W2 Pumping





Fractured Walnut DNAPL





Clean Environment Low Flow Pump



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Well W5



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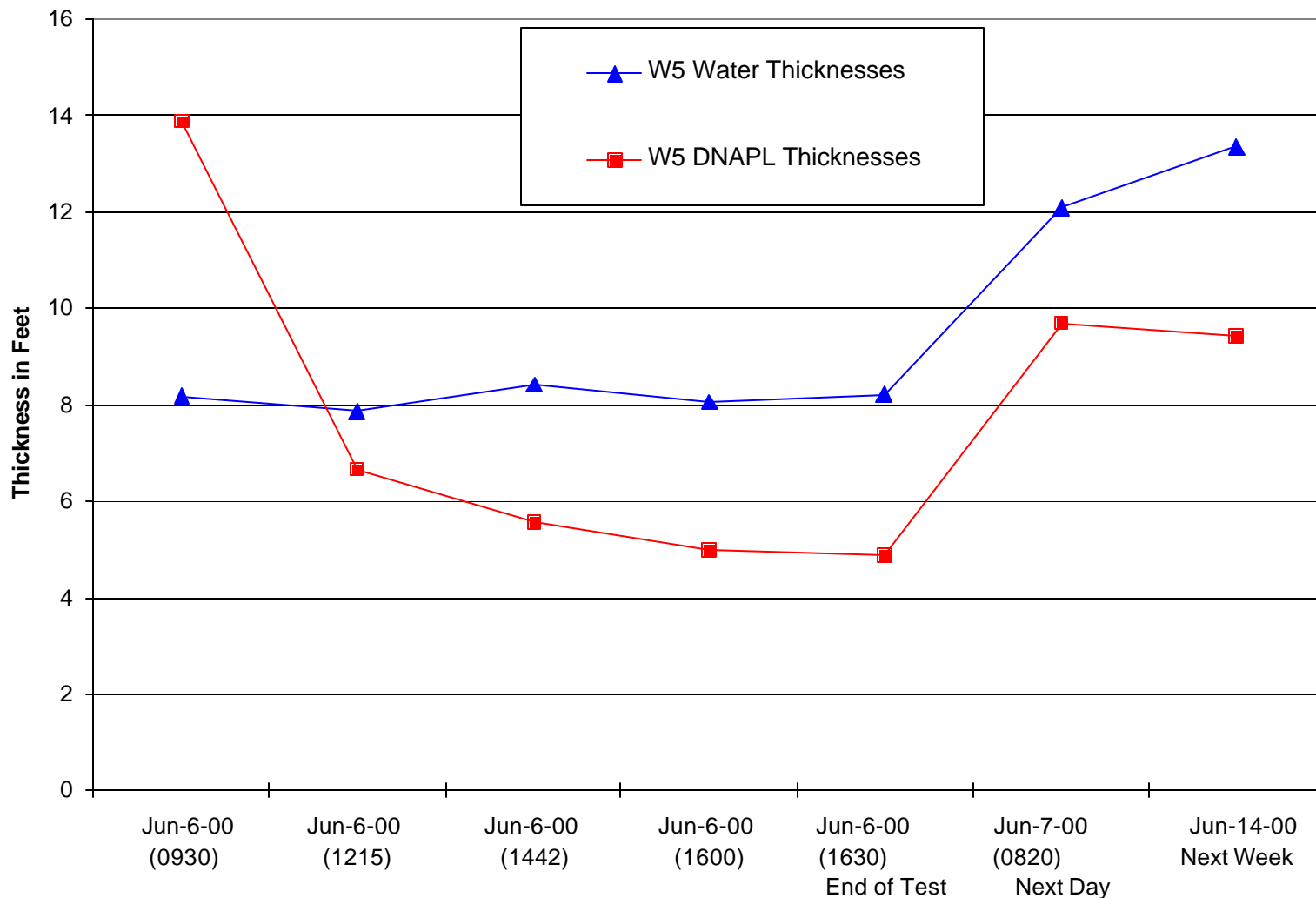
DNAPL Being Recovered



Promoting Readiness through Environmental Stewardship

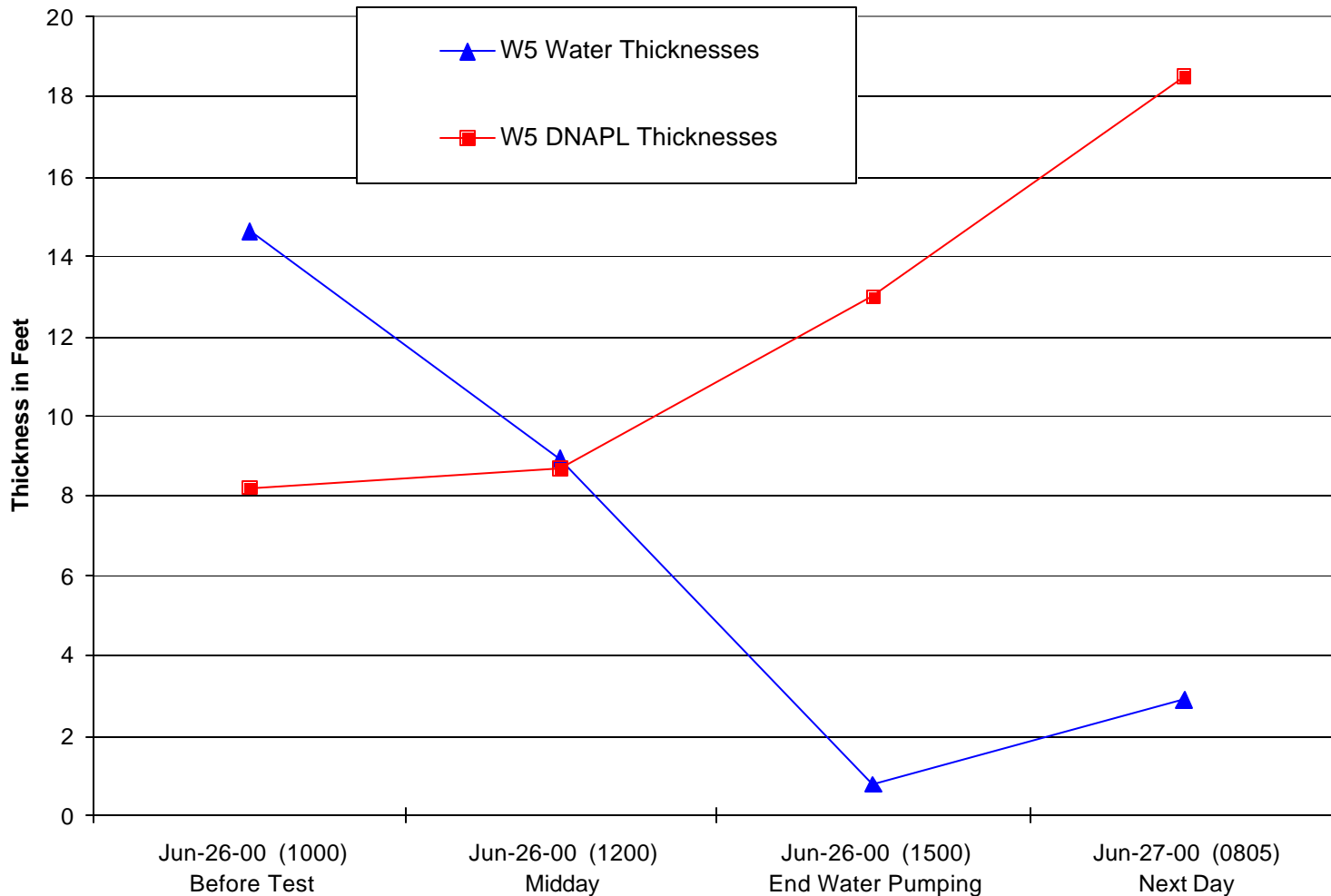


W5 Water & DNAPL Thicknesses, June 6, 2000 DNAPL Pumping



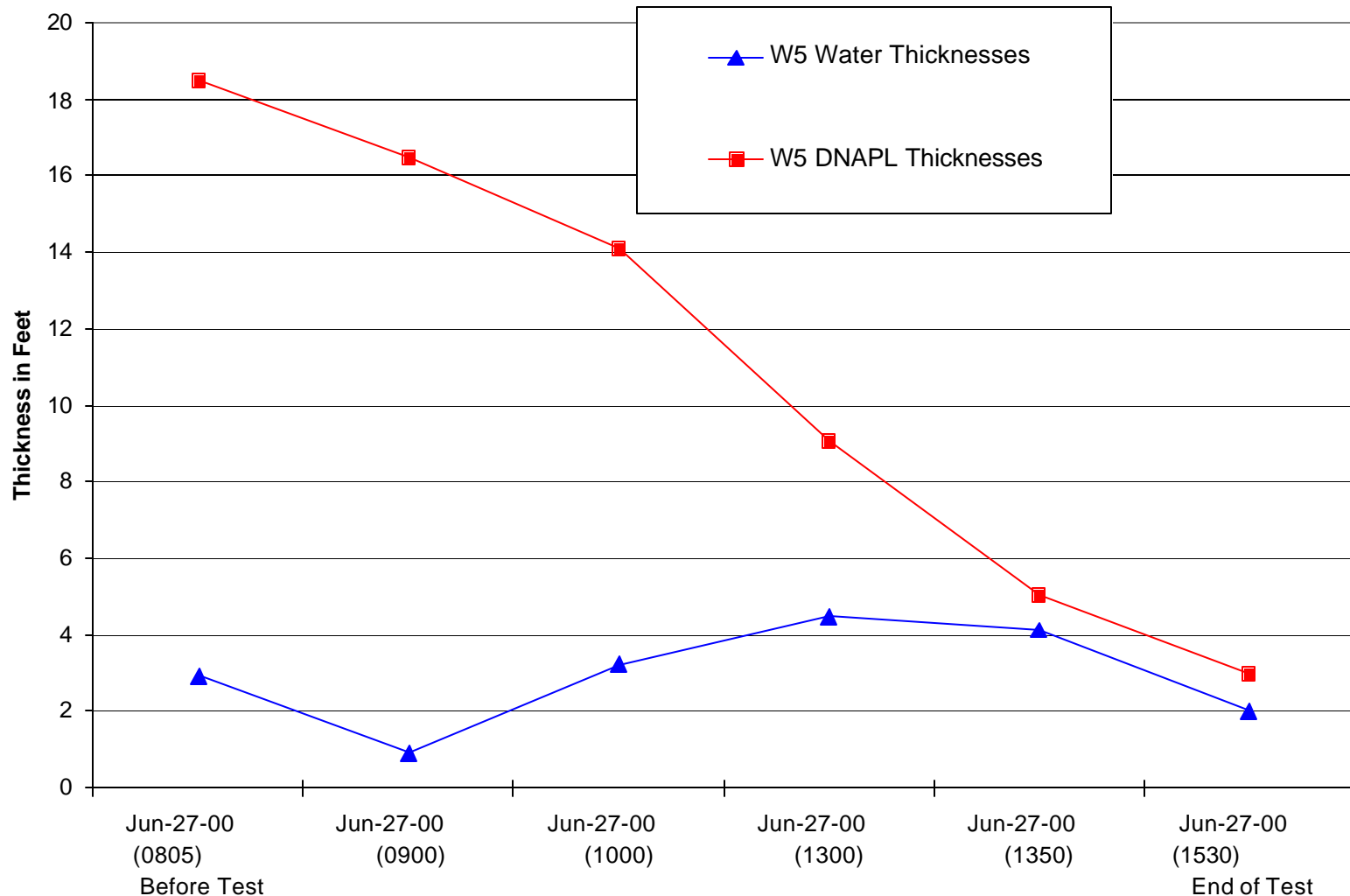


W5 Water & DNAPL Thicknesses, June 26, 2000 Water Removal



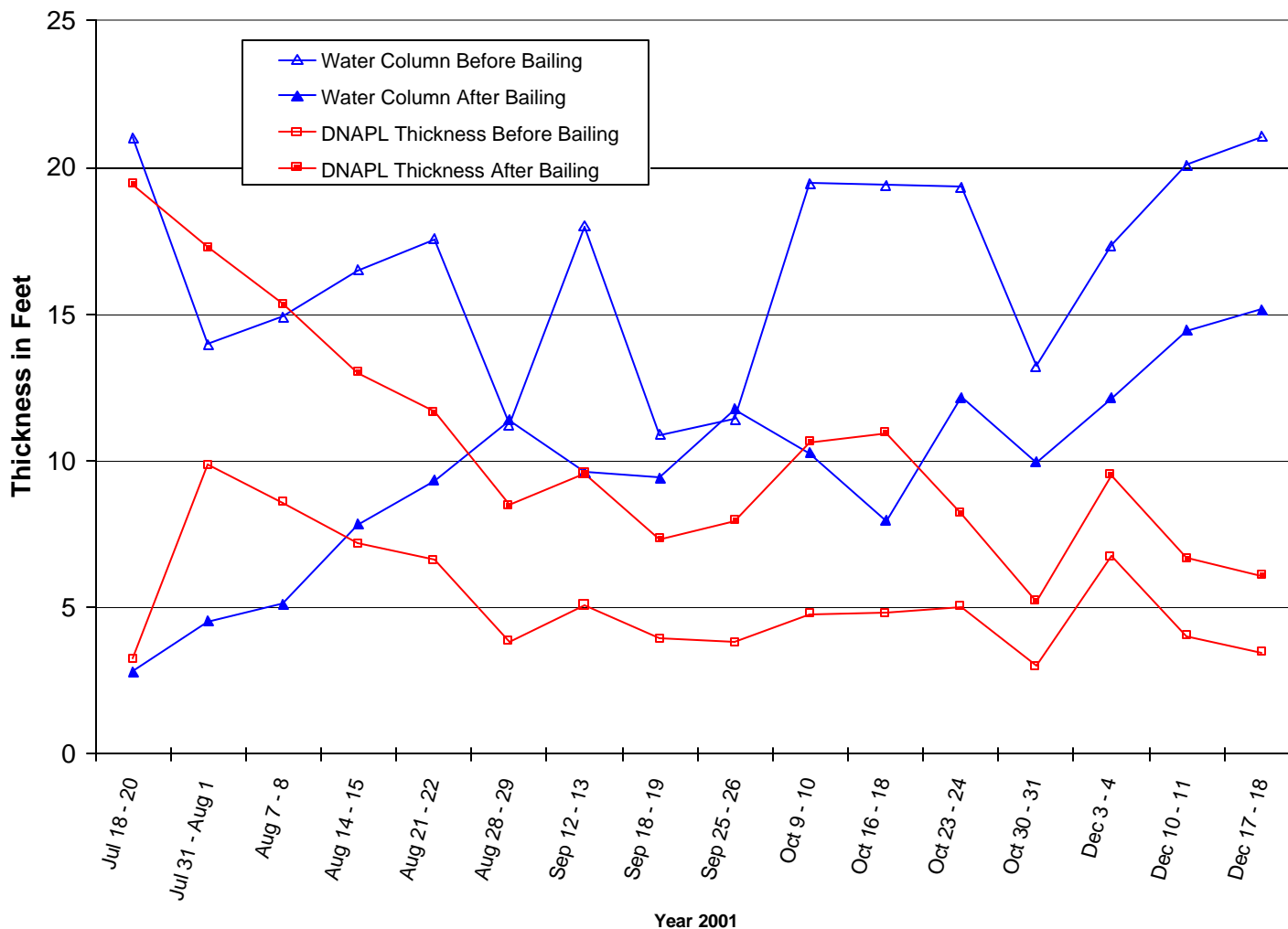


W5 Water & DNAPL Thicknesses, June 27, 2000 DNAPL Pumping



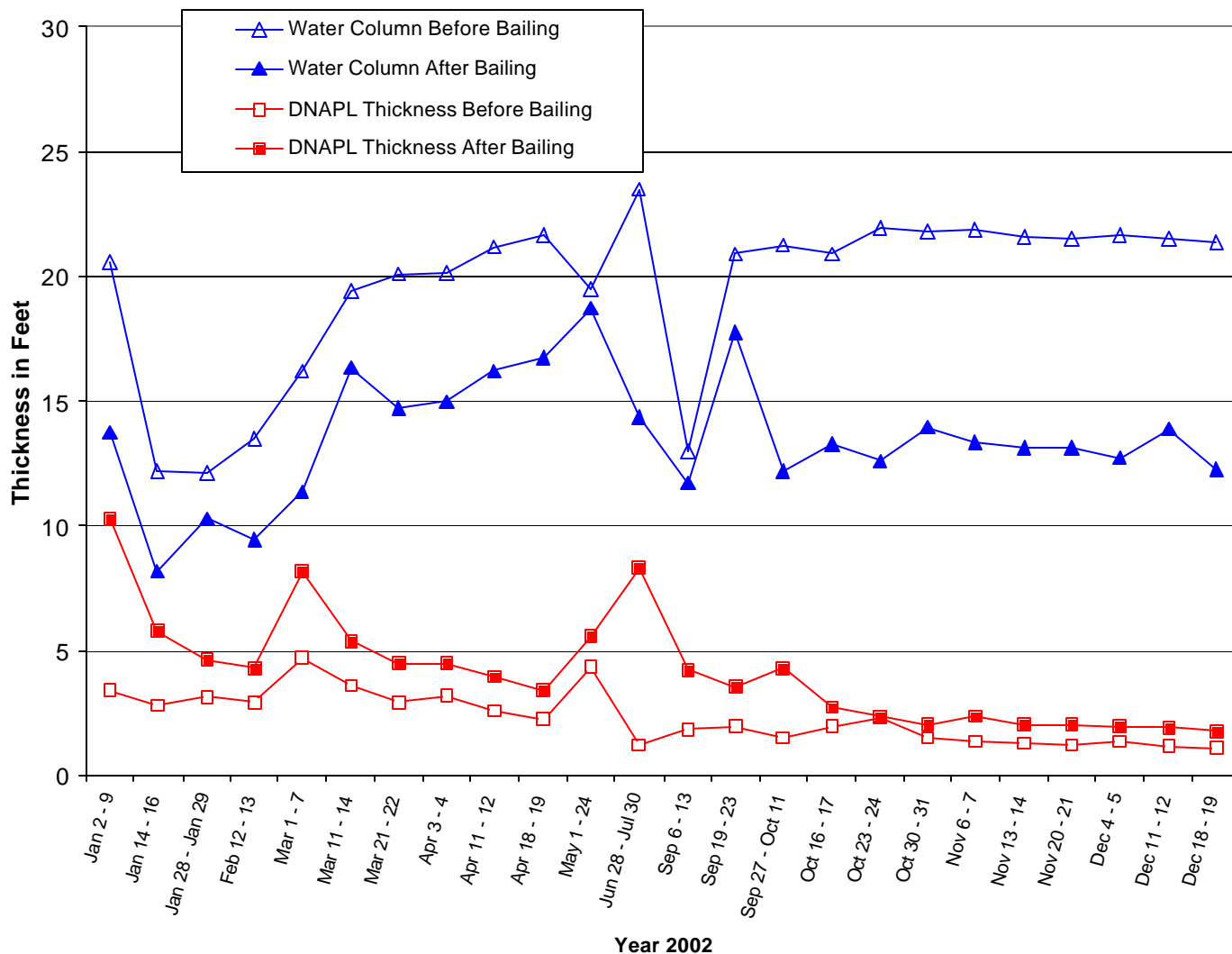


W5 Water and DNAPL Thicknesses Before And After Water Bailing



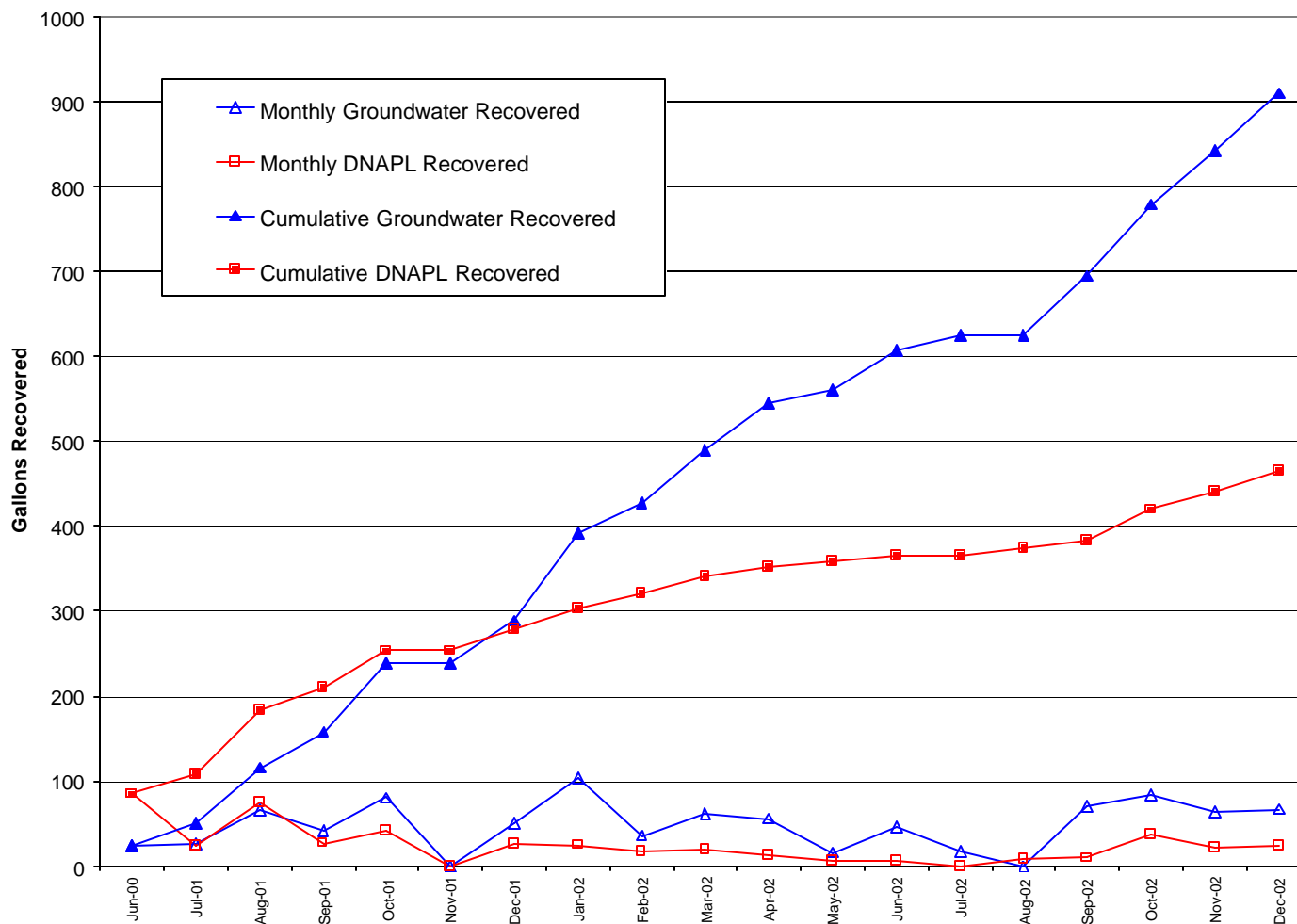


W5 Water and DNAPL Thicknesses Before And After Water Bailing





Groundwater and DNAPL Recovery From Walnut Well W5



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Recovery Works But Will It Get To The MCL?



Promoting Readiness through Environmental Stewardship



Where Is This Getting Us?

- **Texas Commission on Environmental Quality**
 - **Removed recoverable free product**
- **USEPA**
 - **Record of Decision (ROD) Adequate**
 - **Status quo with long-term monitoring in place**
 - **No apparent migration or groundwater quality impact**



Where Is This Getting Us?

- **Air Force**
 - **Continue with DNAPL recovery**
- **Benefits**
 - **Very low cost removal of DNAPL**
 - **Area may be useful for research and development**



Where Is This Getting Us?

- **Risks**

- **DNAPL mobilization to areas where it was not previously present**
- **Intrusive activities may cause DNAPL migration**

- **Long Term**

- **May never reach the MCL (not a remediation goal)**
- **VOCs will desorb from limestone and shale matrix**